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EXAMINER

THORNEWELL, KIMBERLY A

ART UNIT	PAPER NUMBER
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2128

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/671,479

Applicant(s)

ALVAREZ ET AL.

Examiner

Kimberly Thornevell

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8 and 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8 and 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-9 were originally presented for examination and rejected in the Office Action dated 6/7/2006. In the reply dated 12/7/2006, Applicant amended claims 1, 8 and 9 and cancelled claim 7. Therefore claims 1-6, 8 and 9 remain pending in the instant application.

Response to Arguments

2. Applicant's arguments filed 12/7/2006 have been fully considered but they are not persuasive.

Drawings:

3. Applicant has not submitted corrected replacement drawings in order to overcome the objection to figures 1, 4, 5 and 6 for lacking "Prior Art" labels. Moreover, Applicant presented no arguments regarding the objection. Consequently, the objection to figures 1, 4, 5 and 6 is maintained.

Specification:

4. The Examiner thanks Applicant for the replacement abstract and furthermore for amending the specification to overcome the deficiencies pointed out in section 6 of the Office Action dated 6/7/2006. Accordingly, these objections are withdrawn.

Claim Rejections, 35 USC 112, first paragraph:

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5. As per claim 9, Applicant argued that the data processing system comprises a means for carrying out the steps of the method in which the data processing system is an apparatus comprising a data processor, a memory coupled to the processor and computer program code means stored in said memory, where said computer program code means, when executed by the processor, causes the method according to the invention to be executed. Applicant further argued that one of ordinary skill in the art would understand that upon loading, a computer program is capable of executing the steps recited in independent claim 1 with know-how to place the computer program on a computer and operate the computer. The Examiner respectfully traverses because claim 9 is directed to a single means claim.

MPEP 2164.08(a) reads as follows:

2164.08(a) Single Means Claim

A single means claim, i.e., where a means recitation does not appear in combination with another recited element of means, is subject to an undue breadth rejection under 35 U.S.C. 112, first paragraph. In *re Hyatt*, 708 F.2d 712, 714-715, 218 USPQ 195, 197 (Fed. Cir. 1983) (A single means claim which covered every conceivable means for achieving the stated purpose was held nonenabling for the scope of the claim because the specification disclosed at most only those means known to the inventor.). When claims depend on a recited property, a fact situation comparable to *Hyatt* is possible, where the claim covers every conceivable structure (means) for achieving the stated property (result) while the specification discloses at most only those known to the inventor.

The means recitation in claim 9 does not appear in combination with another recited element of means. Hence, claim 9 is not enabled by the specification because only means known by the inventor for achieving the claimed invention have been disclosed. Consequently, the rejection of claim 9 under 35 USC 112, first paragraph is maintained.

Claim Rejections, 35 USC 112, second paragraph

6. The Examiner thanks Applicant for amending the claims to clarify that u is an input vector. Applicant is also thanked for canceling claim 7 in order to remove the negative limitation. However, despite Applicant's amendments to the independent claims, the limitation "the complete state" in step (c) of the claims is still lacking sufficient antecedent basis. Therefore, the rejections for the indefiniteness of "measured variables" and for the negative limitations are withdrawn; however, the rejection of claims 1-9 under 35 USC 112, second paragraph, is maintained because the insufficient antecedent basis for "the complete state."

Claim Rejections, 35 USC 101

7. The amendments to claims 1, 8 and 9 now recite that the computed estimate is presented to a user. However, the claims are still directed to non-statutory subject matter because the methods are directed to an abstract idea in that they merely recite steps for a mathematical algorithm. No specific use for the algorithm is recited, as the measurement of vector u has not been practically applied to a process producing a real-world result.

Furthermore, Applicant stated that support for the added limitation of presenting to a user is found at page 5, line 22 through page 6, line 11, and also at page 13, line 11 through page 14, line 5. However, neither these citations, nor any portion of the disclosure, provide enabling support for the limitation of presenting an estimate to a user. Consequently, Applicant's amendment raises new rejections under 35 USC 112, first paragraph. See detailed explanation below.

Claim Rejections, 35 USC 102

8. Applicant argued that the Bohn reference does not teach or suggest that parameters p are physical process values (Remarks page 10 last paragraph). Applicant further argued that the “Three-Tank System” in chapter 7 of Bohn utilizes the extended Kalman filter and not the State Augmented Extended Kalman Filter as recited in the independent claims (Remarks page 11 first paragraph). The Examiner respectfully traverses Applicant’s arguments.

As to the argument that Bohn does not teach that p represents physical process values, the Examiner respectfully points to page 102, lines 5-9. This section teaches that the parameter vector p consists of parameters that determine the flow between tanks. These parameters are in fact physical (i.e., flow) properties of a physical process (the Three-Tank System experiment, described in detail page 133).

As to the argument that Bohn teaches using the extended Kalman filter as opposed to the State Augmented Extended Kalman Filter in the Three-Tank System of chapter 7, the Examiner respectfully points to pages 101 and 102 of Bohn. Paragraph 1 of page 101 teaches using the “adaptive Extended Kalman Filter developed in Chapter 4” in order to perform the three-tank system experiment. On page 102 the state transition function $f(x, u, p)$ is defined. In chapter 4, more particularly on page 33 equation 4.2, that same transition function is used in defining the “augmented state vector” (page 33 section 4.2). Therefore the Examiner asserts that the extended Kalman filter developed in chapter 4 used in the three-tank system is in fact the state augmented extended Kalman filter.

Because the Bohn reference discloses all elements of claims 1-3, the rejection of the claims under 35 USC 102(b) is maintained.

Claim Rejections, 35 USC 103(a)

9. Regarding claim 4,

Applicant argued that Rutherford does not overcome the deficiencies set forth in claim 1 (i.e., representing vector variables p as one or more varying physical properties of the process, or representing p by a function of the state vector x , Remarks page 12 first full paragraph). However, as argued above, Bohn teaches all elements of claim 1. Therefore the rejection of claim 4 over Bohn in view of Rutherford under 35 USC 103(a) is maintained.

10. Regarding claim 5,

Applicant argued that Parlos teaches away from using the Kalman filter for developing state filters, and also that Parlos and Bohn, either in combination or individually do not disclose or suggest all of the features recited in independent claim 1 (Remarks page 13 lines 7-16). The Examiner respectfully traverses because the argument that the Parlos reference is a teaching away from using the extended Kalman filter is conclusive based on speculation. Even though the extended Kalman filters were compared against the neural state filters throughout the reference, the extended Kalman filters were in fact used in a heat exchanger implementation on page 1427 last paragraph and on page 1430 first column, particularly the first full paragraph. Therefore it is not a teaching away to use the extended Kalman filter in a physical process such as a heat exchanger (claim 5), as it has been done. The motivation for using an extended Kalman filter in a heat exchanger would have been to give Bohn's teachings of the SAEKF a real-world application, as desired by Bohn (page 3 section 1.2 first paragraph, applying recursive parameter

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estimation to thermodynamics) by estimating heat transfer parameters for a steam generator (Parlos page 1412 column 2 first bullet). Furthermore, as argued above, Bohn teaches all elements of claim 1. Therefore the rejection of claim 5 over Bohn in view of Parlos under 35 USC 103(a) is maintained.

11. Regarding claim 6,

12. Applicant argued that Draper does not overcome the deficiencies set forth in claim 1 (i.e., representing vector variables p as one or more varying physical properties of the process, or representing p by a function of the state vector x , Remarks page 13 last paragraph). However, as argued above, Bohn teaches all elements of claim 1. Therefore the rejection of claim 6 over Bohn in view of Draper under 35 USC 103(a) is maintained.

Drawings

13. Figures 1, 4, 5 and 6 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See the discussion of these figures in the specification. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

14. The amendment filed 3/9/2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure includes the reference to Robert Stengel, "Optimal Control and Estimation," Dover Publications, 1994, pp.342-351 and pp. 386-392.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

15. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

16. Claims 1-6, 8 and 9 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 1, 8 and 9 recite a step of presenting an estimate to a user. The claims not enable one of ordinary skill in the art to present an estimate to a user, the specification does not sufficiently disclose how, or by what means an estimate is presented.

Furthermore, claim 9 is directed to a single means claim. The means recitation in claim 9 does not appear in combination with another recited element of means. Hence, claim 9 is not enabled by the specification because only means known by the inventor for achieving the

claimed invention have been disclosed. Moreover, the means for carrying out the claimed method is an improper invocation of 35 USC 112, sixth paragraph, because the single means appears to either be applied individually to each limitation, and/or is the same means for all limitations.

17. Claim 9 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 9 is directed to a single means for carrying out steps of a method. This "means" was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The disclosure of the invention contains no written description of a structure for the "means for" in claim 9 to work.

18. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

19. Claims 1-6, 8 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

20. Claims 1, 8 and 9 contain the limitation of "measuring values of an *input vector u*." It is unclear what the vector *u* represents and how it is related to the rest of the claim. Furthermore, claims 1, 8 and 9 recite the limitation "the complete state" in line 1 of step c. There is

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insufficient antecedent basis for this limitation in the claims. Claims 2-6 are rejected because of their dependence on claim 1.

21. Claim 9 is directed to a single means for carrying out the steps of a method. This means is recited only once in the preamble. It is unclear whether this "means" is applied individually to each limitation, or if it is the same means for all limitations in the claim.

Claim Rejections - 35 USC § 101

22. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

23. Claims 1-9 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims are directed to non-statutory subject matter because the method recited in claim 1 is directed to an abstract idea in that they merely recite steps for a mathematical algorithm. No specific use for the algorithm is recited, as the measurement of vector u has not been obtained in real time from a real process, at least as claimed.

Claim 8 is directed to a computer program embodied on a computer-readable medium which is loadable and executable on a data processing unit and which computer program, when being executed, performs the steps similar to the method steps of claim 1. Because no practical application is made in the method executed by the program, no tangible, real-world result is achieved. Therefore the method executed by the program is an abstract idea and deemed non-statutory.

Claim 9 suffers deficiencies similar to claim 8 above. Claim 9 is directed to a data processing system comprising means for carrying out the steps of a method similar to the method

steps of claim 1. Again, the method makes no practical application in order to produce a tangible, real-world result.

Claim Rejections - 35 USC § 102

24. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

25. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohn, in his doctoral dissertation “Recursive Parameter Estimation for Nonlinear Continuous-Time Systems through Sensitivity-Model-Based Adaptive Filters,” submitted to the Department of Electrical Engineering and Information Sciences, at Ruhr-Universitat Bochum in 2000.

As per claim 1, Bohn discloses a method for estimating a value of a vector of variables p in a mathematical model representing a physical process (**page 33 section 4.2 first paragraph**); where a state vector x of the model is estimated by a State Augmented Extended Kalman Filter (SAEKF), wherein the vector of variables p represents one or more varying physical properties of the physical process (**page xii, definition for p , page 102 lines 5-9 for physical properties of the physical process**) and is representable by a function of the state vector x (**page 35 equation 4.5**), wherein the method comprises the steps of:

- measuring values of an input vector u (**sentence bridging pages 33 and 34, input vector taught on page 102, line 4**);

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- incorporating the vector of variables **p** as an augmented state in the SAEKF (**page 33 equation 4.1, definition of p on page xii**), and
- computing an estimate of the complete state including the augmented state according to a SAEKF algorithm (**page 35 equation 4.5**); and
- presenting the estimate to a user (**page 105 paragraph 1, displaying results**).

As per claim 2, Bohn discloses the system equations of the model estimated by the SAEKF being representable as:

$$\dot{\begin{bmatrix} \mathbf{x} \\ \mathbf{p} \end{bmatrix}} = \begin{bmatrix} \mathbf{f}(\mathbf{x}, \mathbf{u}, \mathbf{p}) \\ \mathbf{0} \end{bmatrix} + \mathbf{v} \quad \text{(page 33 equation 4.2)}$$

where $\mathbf{f}(\mathbf{x}, \mathbf{u}, \mathbf{p})$ represents a known dependency of the change $\dot{\mathbf{x}}$ in system state from the system state \mathbf{x} (**page xiv, definition of f**), the measured values \mathbf{u} and the vector of variables \mathbf{p} , and \mathbf{v} represents noise disturbances (**page xiii, definition of v**).

As per claim 3, Bohn discloses estimating parameters of a representation of the vector of variables \mathbf{p} in terms of the state vector \mathbf{x} (**page 33 equation 4.1**).

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention

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was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

27. Claims 8 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn.

As per claim 8,

Bohn discloses a method for estimating a value of a vector of variables p in a mathematical model representing a physical process comprising the steps of:

- measuring values of an input vector u (**sentence bridging pages 33 and 34, input vector taught on page 102, line 4**);
- incorporating the vector of variables p as an augmented state in the SAEKF (**page 33 equation 4.1, definition of p on page xii**), and
- computing an estimate of the complete state including the augmented state according to a SAEKF algorithm (**page 35 equation 4.5**); and
- presenting the estimate to a user (**page 105 paragraph 1, displaying results**).

Bohn does not disclose expressly the above method steps being on a computer program embodied on a computer-readable medium which is loadable and executable on a data processing unit and which computer program. However, in chapter 6 of his dissertation, Bohn discusses simulation of the Kalman filters. More specifically, in section 6.2, pages 74-75, he discusses simulation of parameter estimation for a Van der Pol Oscillator using an SAEKF. Because the behavior of the Van der Pol oscillator is simulated using a simulation program in order to achieve the outputs as shown on page 76, it is obvious that the method could have been performed on a computer program.

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As per claim 9,

Bohn discloses a method of:

- measuring values of an input vector u (**sentence bridging pages 33 and 34, input vector taught on page 102, line 4**);
- incorporating the vector of variables p as an augmented state in the SAEKF (**page 33 equation 4.1, definition of p on page xii**), and
- computing an estimate of the complete state including the augmented state according to a SAEKF algorithm (**page 35 equation 4.5**); and
- presenting the estimate to a user (**page 105 paragraph 1, displaying results**).

Bohn does not disclose expressly a data processing system comprising means for carrying out the steps of the method. As described with respect to claim 8 above, chapter 6, pages 74-75 of Bohn's dissertation is drawn to simulation of the Van der Pol Oscillator using an SAEKF. Because the method of claim 1 was simulated using a simulation program, it is obvious that the method would have been executed on a computer (i.e.- a data processing system).

28. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Rutherford et al., US Patent no. 6,741,955.

Bohn does not disclose expressly relating the SAEKF method to a turbomachine. Rutherford discloses a *method for estimating mass flow rate of a turbomachine* (paragraph joining columns 1 and 2) using an Extended Kalman Filter (column 5 lines 18-21). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn's teachings of the SAEKF with Rutherford's mass flow

estimation application of the Extended Kalman Filter. The motivation for doing so would have been to give Bohn's teachings a real-world application by estimating parameters for leak prediction (Rutherford column 5 lines 6-21).

29. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Parlos et al., "An Algorithmic Approach to Adaptive State Filtering Using Recurrent Neural Networks," published in IEEE Transactions on Neural Networks, November 2001.

Bohn does not disclose expressly relating the SAEKF method to a heat exchanger. Parlos discloses a method for *estimating heat transfer coefficients in a heat exchanger using an Extended Kalman Filter* (page 1430 first full paragraph lines 1-3). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn's teachings of the SAEKF a real-world application, as desired by Bohn (page 3 section 1.2 first paragraph, applying recursive parameter estimation to thermodynamics) with Parlos' heat transfer estimation application of the Extended Kalman Filter. The motivation for doing so would have been to give Bohn's teachings a real-world application by estimating heat transfer parameters for a steam generator (Parlos page 1412 column 2 first bullet).

30. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Draper et al., "Learning Augmented Recursive Estimation for Uncertain Nonlinear Dynamical Systems," published in IEEE International Symposium on Intelligent Control, September 1996.

Bohn does not disclose expressly relating the SAEKF method to a spring function. Draper discloses *modeling a spring function and backlash* (page 441 section 5 paragraph 1)

using an AEKF (page 442 first full paragraph). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn's teachings of the SAEKF with Draper's spring backlash estimation application of the Augmented Extended Kalman Filter. The motivation for doing so would have been to give Bohn's teachings a real-world application by estimating behavior of a spring (Draper, abstract).

Conclusion

31. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

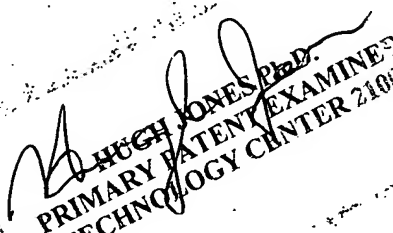
32. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly Thornewell whose telephone number is (571)272-6543. The examiner can normally be reached on 9am-5:30pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kimberly A. Thornewell
Patent Examiner
Art Unit 2128

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